Overhead irrigation of soybeans – southern NSW 2014–15

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Key findings

- High soybean grain yields can be achieved on a flat layout under overhead irrigation.
- Djakal and N005A-80 varieties yielded the highest across all densities and row spacings.
- The 40 plants/m^2 targeted plant density yielded the highest across all varieties and row spacings.
- At targeted plant densities of 40 plants/m^2, the highest yields were achieved with 30 cm row spacing.

Introduction

Soybeans in southern NSW are preferably grown on raised-bed layouts with furrow irrigation. An alternative for flat to undulating ground is to use overhead irrigation.

This experiment was conducted over the 2014–15 season with overhead irrigation on a relatively flat site in the Finley area of southern NSW. The purpose of the experiment was to test the response of one new breeding line and two commercial varieties of soybeans at three row spacings and two plant densities to examine the effect of these treatments on dry matter production, harvest index, grain yield and grain protein.

Warmer than average temperatures were recorded during the 2014–15 season with a total of 2,172 growing-degree days [(max. temp. + min. temp.)/2) -5 °C] compared with the long-term average of 1,983 day degree units.

Site details

Location	'Cooinda' Closes Rd, Finley, NSW
Experiment period	Summer growing season 2014–15
Soil type	Red-brown, fine, sandy-clay loam over light clay
Previous crop	Wheat (stubble baled)
Establishment irrigation	Rainfall and post-sowing irrigation
Irrigation method	Overhead irrigation
Sowing date	20 November 2014
Inoculation	Water injected peat slurry Group H
Fertiliser	125 kg/ha legume starter
Herbicides pre-emergent	Roundup 450 @ 1.5 L/ha + trifluralin @1.6 L/ha
Insecticides	Indoxacarb 150 g/L @ 400 mL/ha by air
In-crop rainfall	179 mm plus irrigation as required
Irrigations	7.83 ML/ha
Harvest date	15–16 April 2015

Treatments

Varieties	Djakal Bidgee[(1)] N005A-80 (unreleased breeding line)
Row spacing	2 rows/plot (90 cm) 3 rows/plot (60 cm) 6 rows/plot (30 cm)
Targeted plant density	25 plants/m^2 40 plants/m^2

Results

Variety

When averaged across all row spacings and targeted plant densities, the Djakal and N005A-80 grain yield was significantly higher than Bidgee. The highest yielding variety treatments were Djakal and N005A-80 at 40 plants/m^2 on 30 cm row spacings (Figure 1).

There was a significant interaction between variety and row spacing for peak dry matter production (Figure 2). Both Djakal and N005A-80 achieved their highest dry matter yield at the 60 cm row spacing; however, there was no statistical difference between 30 and 60 cm in dry matter production

for these varieties. Bidgee dry matter declined linearly as row spacing widened, with dry matter yield at the 90 cm row spacing significantly lower than at the 30 and 60 cm row spacing (Figure 2).

Row spacing

When averaged across all varieties and targeted plant densities, the grain yield from the 30 cm row spacing was significantly higher than either the 60 and 90 cm row spacings, which yielded 4.1 t/ha, 3.6 t/ha and 3.3 t/ha respectively.

Total dry matter averaged across all varieties and targeted plant densities was significantly higher for the 30 and 60 cm row spacings than the 90 cm row spacing, producing 10.0 t/ha, 10.4 t/ha and 8.5 t/ha respectively. This higher dry matter in part explains how the narrower row spacing was higher yielding than the 90 cm row spacing. In general terms, grain yield is correlated with total dry matter production.

Targeted plant density

The actual plant densities achieved for the 25 plants/m^2 and 40 plants/m^2 density targets were an average of 21 plants/m^2 and 31 plants/m^2 respectively. Across all varieties and row spacings, the 40 plants/m^2 plant density was significantly higher yielding than 25 plants/m^2, yielding 3.9 t/ha and 3.4 t/ha respectively.

There was a significant interaction between targeted plant density and row spacing (Figure 3). At the higher plant density (40 plants/m^2), the narrower row spacing (30 cm) yielded higher than the wider row spacings (60 and 90 cm) for all three varieties. However, at the lower plant density (25 plants/m^2) there was no statistical effect of row spacing on grain yield for Bidgee or Djakal, with the only exception being N005A-80 at the 90 cm row spacing. From this data, it is apparent that plant density has a greater influence on grain yield than row spacing.

Summary

This experiment demonstrated that under overhead irrigation on a relatively flat layout, soybean grain yield above 4.5 t/ha is achievable. Variety selection, row spacing and plant density are all key agronomic factors for achieving high yields under this irrigation method and paddock layout. In summary, in this experiment:

- Djakal and N005A-80 varieties yielded higher than Bidgee
- under overhead irrigation, 30 cm row spacing was found to be the optimum, especially at higher plant densities
- the optimum plant density, especially at narrow row spacings was 31 plants/m^2
- maintaining a population at or above this level is critical to maximising yield potential.

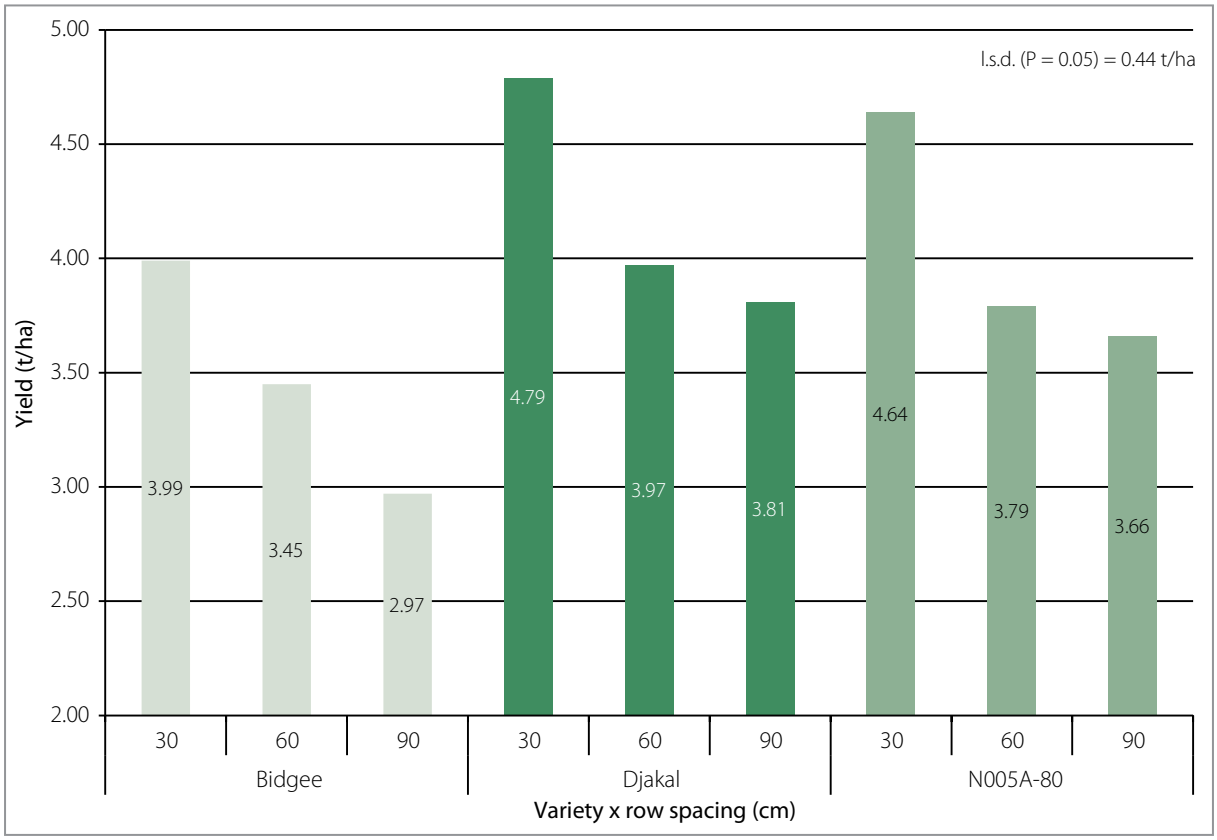

Figure 1. Soybean grain yield for variety and row spacing at the 40 plants/m^2 plant density.

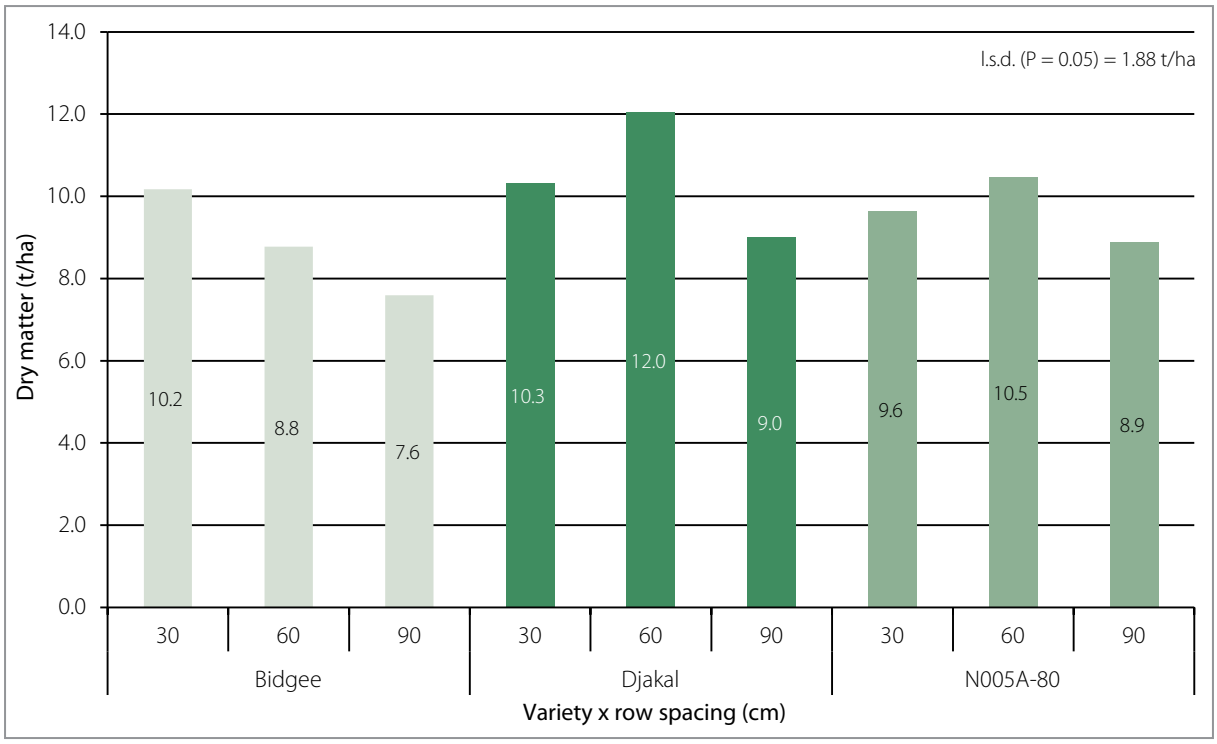

Figure 2. Soybean dry matter for variety and row spacing interaction at the 40 plants/m^2 plant density.

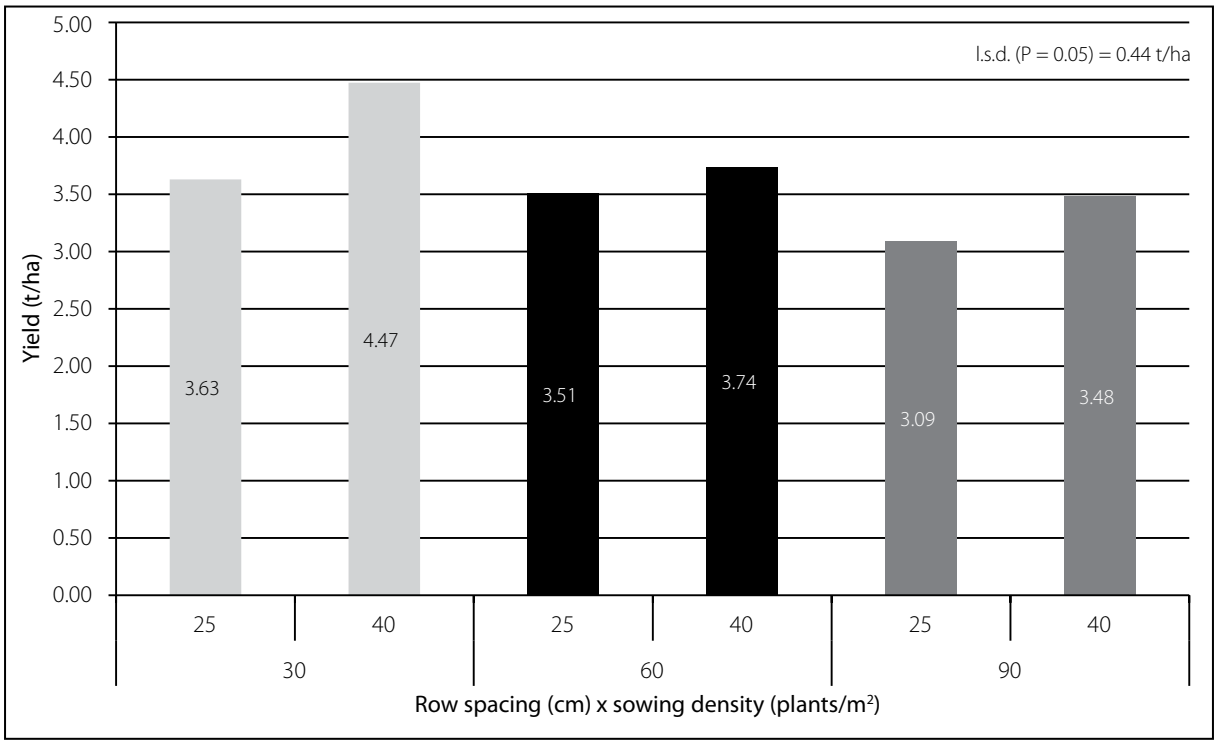

Figure 3. Soybean grain yield for row spacing and plant density averaged across varieties.

Acknowledgements

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